Rationale for the Establishment of the

Washington State Department of Health's Clandestine Drug Lab Program Decontamination Standards

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For more information or additional copies
of this report, contact:

Clandestine Drug Lab Program
Division of Environmental Health
Washington State Department of Health
PO Box 47825
Olympia, WA 98504-7825

Phone: 360-236-3381
Fax: 360-236-2261

Mary Selecky
Secretary of Health

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Washington State passed legislation in 1990 mandating the cleanup of properties contaminated by illegal clandestine drug lab (CDL) activity in order to protect the health of future occupants of the properties[1] The legislation authorized the Washington State Department of Health (DOH) to develop numeric decontamination standards and certify cleanup contractors to evaluate and clean up illegal drug labs. The goal of the decontamination standards is to provide protection for all people, particularly for infants and children, who are thought to be the most susceptible to the toxic effects of residual chemicals. This susceptibility is a result of numerous factors, including the young child's developing physiology, higher intake of food, air, and fluids in proportion to their body weight compared to adults, and their unique behavior patterns. The decontamination standards must be attained before local health jurisdictions (LHJs) can clear a residence for reoccupancy.

The standards were developed to address chemicals associated with the manufacture of methamphetamine, since these types of labs represent the majority of illegal drug labs in Washington State. As new illegal drug manufacturing methods and processes are developed, and different chemicals and byproducts are produced, additional standards may need to be incorporated in the regulation. Although a large variety of chemicals may be found at illegal methamphetamine manufacturing labs, DOH selected four of primary concern commonly associated with these types of labs; methamphetamine, total volatile organic compounds (VOCs), lead, and mercury. The decontamination standards are listed in section 541 of Chapter 246-205 WAC, and are as follows:

Chemical	Type of sample	Decontamination standard
Methamphetamine (1)	Surface area wipe	≤ 0.1 μg/100cm^2
Total Volatile Organic Compounds (VOCs) (2)	Air	1 ppm
Lead (total) (3)	Surface area wipe	≤ 20 μg/ft^2
Mercury (4)	Air	≤ 50 ng/m^3

(1) Units are in micrograms of methamphetamine per one hundred square centimeters of surface area.
(2) Units are in parts per million.
(3) Units are in micrograms of lead per square foot of surface area.
(4) Units are in nanograms of mercury per cubic meter of air.
(one thousand nanograms equals one microgram).

Methamphetamine Standard

DOH reviewed the scientific literature on the health effects of methamphetamine and other amphetamine-related drugs. These studies focused primarily on prenatal exposure during pregnancy in humans and on high dose studies in animals. Studies on the health effects associated with chronic exposures to low concentrations of methamphetamine are not available.

Human and Animal studies

The effect of methamphetamine on the development of the nervous system is known from studies of fetuses exposed in the womb of female methamphetamine users. No studies have evaluated the health effects of children directly exposed to methamphetamine in illegal drug labs. The studies have shown significantly lower intelligence testing scores compared to infants not exposed in the womb, and that those exposed may be at risk later in life for subtle neurological abnormalities.[2] Numerous physical malformations resulting from prenatal exposure to amphetamine and methamphetamine have been reported including cleft lip, cardiac defects, low birth weight, reduced head circumference, biliary atresia, cerebral hemorrhage, low body fat, systolic murmur, and undescended testes.[3]

Numerous animal studies have been conducted to evaluate the health effects of methamphetamine exposure. Studies conducted on rats and monkeys have demonstrated the adverse effects of methamphetamine on the central nervous system, selective reductions in brain serotonin and dopamine concentrations, and neurological damage. [4] In a 1998 study, rats exposed to methamphetamine were observed to have increased occurrences of retinal hemorrhages compared to control groups.[5] In another 1998 study conducted on baboons, methamphetamine produced long-term decreases on brain dopamine axonal markers at all doses tested.[6] In a 1994 rat study, methamphetamine-treated groups exhibited reduced locomotor activity compared to untreated groups.[7] A 2003 rat study supported the position that neonatally methamphetamine-exposed animals may exhibit hypoactivity.[8] In other studies, reduced body weights were observed in rats exposed to methamphetamine.

DOH's Approach

A quantitative exposure/risk assessment was not conducted during development of the methamphetamine standard, since studies about the potential long-term health risks associated with chronic, low-level exposure to methamphetamine are not available, controlled human exposure studies are unlikely for ethical reasons, and available toxicity data are limited. Washington State adopted a preventative approach that recognized the potential of the magnitude of childhood exposures and associated health risks because of the number of children found living in residential CDLs. Because of the extent of the

CDL problem in Washington State, DOH did not want to wait for the derivation of methamphetamine-specific toxicity factors and the completion of a quantitative risk assessment before establishing a decontamination standard for methamphetamine. DOH chose to adopt a feasibility-based approach when establishing the current methamphetamine standard. This approach was based on the following primary considerations:

1. Analytical limitations and;
2. A cleanup level to which methamphetamine could reasonably be achieved.

Currently, other states, private researchers, and the National Alliance for Model State Drug Laws are working towards the assessment of appropriate indicator chemicals and the development of health-based decontamination standards that state and local drug lab programs can choose to adopt when assessing and remediating illegal drug labs. In addition, federal legislation is being introduced to address site assessment and remediation issues, and to identify new methamphetamine detection technologies, research needs, and other data gaps. DOH will continue to use its current methamphetamine decontamination standard until additional research demonstrates the appropriateness of a different standard.

In February 2005, the Colorado Department of Public Health (CDPH) prepared a paper that attempted to correlate existing states' detection-based cleanup standards for methamphetamine to known health-effect-based concentrations.[9] In doing so, CDPH estimated residential methamphetamine exposures using standard exposure assumptions. Using these standard exposure assumptions, the estimated dose for an infant exposed to 0.1ug/100 cm^2 methamphetamine (the Washington State decontamination standard) was 50 times lower than the most protective reference dose derived by CDPH. The reference dose was based on reproductive toxicity. What this indicates is that the current Washington State methamphetamine decontamination standard appears to be well below levels that would be expected to cause adverse noncancer health effects, such as reproductive toxicity, for persons chronically exposed to methamphetamine at the 0.1 ug/100cm^2 decontamination standard.

Total Volatile Organic Compounds (VOC) Standard

Volatile Organic Compounds (VOCs) were recognized as being common to all CDL sites. VOCs include many different chemical compounds, a number of which are used in the manufacture of illegal drugs including toluene, acetone, methanol, petroleum distillates, and ethers, among others. DOH believed it was most practical and cost-effective to test for total VOCs, rather than require testing for dozens of individual VOCs in air. Using the portable photoionization detector (PID), total VOCs can routinely be detected at the 1 part per million (ppm) level.

When establishing the VOC standard, DOH also recognized that by the time the remediated residences are reoccupied, levels of VOCs are expected to be lower as a result of the removal of the primary sources of the VOCs, such as the bulk chemicals and porous household materials. Additionally, volatilization of residual VOCs to significantly lower levels will likely have occurred. DOH also recognized the fact that studies have documented the presence of "background" levels of VOCs in ambient and indoor air.[10] Sources of these background VOCs include industrial and automobile emissions, consumer products, and building materials, among others. For this reason, it was not realistic for DOH to require VOC levels to be zero or below reasonable background levels.

Lead (Pb) Standard

DOH recommends testing for lead only at residences where it is evident that the amalgam (P2P) method or other methods involving lead were used. Currently, methods involving lead are rarely seen at drug lab sites in Washington State.

The health effects from chronic exposure to lead, and its particular health implications for fetuses, infants, and toddlers are well documented. Young children and the developing fetus are more vulnerable to lead poisoning than adults. Lead can affect almost every organ and system in the body, the most sensitive being the central nervous system. Lead also damages kidneys and the reproductive system.[11]

DOH considered existing health and toxicity information when establishing the decontamination standard for lead. DOH also considered the presence of background levels of lead often found in older homes, since lead-based paint is frequently present in such homes where many illegal drug labs are found. The current 20 micrograms per square foot (20 $\mu g/ft^2$) lead wipe standard is one half of the U.S. Department of Housing and Urban Development's (HUD) current floor wipe clearance standard and one half of the U.S. Environmental Protection Agency's (EPA) lead hazard standard. DOH also considered the growing body of scientific data that indicates the blood lead threshold for adverse health effects, including nervous system effects, is lower than the CDC's current 10 micrograms of lead per deciliter of blood lead level of concern. Given this data, DOH believed it was prudent to establish a lower lead wipe standard than the current HUD and EPA standards.

Mercury (Hg) Standard

DOH recommends testing for mercury only at residences where it is evident that the amalgam (P2P) method, or other methods involving mercury were used. Currently, methods involving mercury are rarely seen at drug lab sites in Washington state.

Exposure to mercury can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Short-term exposure to high levels of metallic mercury vapors may cause lung damage, increases in blood pressure or heart rate, skin rashes, and eye irritation. Inhalation of mercury vapor is particularly harmful. Fetuses and young children are more sensitive to mercury's health effects than adults. Mercury's effects upon the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. A nursing infant can also be exposed to mercury from breast milk. High levels of mercury in the bloodstream of the fetus and young child may harm the developing nervous system.[12]

The mercury decontamination standard is more protective than current Washington State Department of Ecology and federal health/risk-based screening levels for mercury. Because of the severity of health effects associated with mercury exposure, DOH chose to use the lowest measurable amount using standard sampling and analytical methods as the basis of the standard. DOH also established a lower mercury standard than existing state and federal health-based screening levels to account for cumulative exposures from other sources of mercury, such as from diet, air, dental amalgams, and some commercial paints. For example, ambient background concentrations of mercury in air have been documented, and are reported to average approximately 10-20 ng/m^3, with higher concentrations in industrialized areas.[13] To account for these background exposures or "body burdens", DOH set the mercury decontamination standard below existing health-based screening levels.

References

[1] Chapter 246-205 WAC – Decontamination of Illegal Drug Manufacturing or Storage Sites, June 18, 2003 Update.

[2] Struthers MD and Hansen RL. Visual recognition memory in drug-exposed infants. J Dev Behav Pediatr. 1992;13(2): 108-111.

[3] Plessinger MA. Prenatal exposure to amphetamines. Obs Gyn Clin North Am. 1998;25(1):119-138.

[4] Ricaurte G, Bryan G, Strauss L, Seiden L, and Schuster C. Hallucinogenic amphetamine selectively destroys brain serotonin nerve terminals. Science. 1988;94:448-457.

[5] J. Gomes-Da-Silva, M. C. Silva and M. A. Tavares. Developmental Exposure to Methamphetamine: A Neonatal Model in the Rat. Annals of the New York Academy of Sciences 844:310-313 (1998).

[6] Villemagne, V, Yuan J, Wong DF, Dannals RF, Hatzidimitriou G, Mathews VB, Ravert HT, Musachio J, McCann UD, and Ricaurte GA. Brain Dopamine Neurotoxicity in Baboons Treated with Doses of Methamphetamine Comparable to those Recreationally Abused by Humans: Evidence from [^{11}C]WIN-35,428 Positron Emission Tomography Studies and Direct *In Vitro* Determinations. The Journal of Neuroscience, 1998. 18(1): 419-427.

[7] Vorhees CV, Ahrens KG, Acuff-Smith KD, Schilling MA, Fisher JE. 1994. Methamphetamine Exposure During Early Postnatal Development in Rats: II. Hypoactivity and Altered Responses to Pharmacological Challenge. Psychopharmacology. 114: 402-408.

[8] Williams, MT., Blankenmeyer TL, Schaefer TL, Brown CA, Budelsky GA, and Vorhees CV. 2003. Long-term Effects of Neonatal Methamphetamine Exposure in Rats on Spatial Learning in the Barnes Maze and on Cliff Avoidance, Corticosterone Release, and Neurotoxicity in Adulthood. Developmental Brain Research 147: 163-175.

[9] Support for Selection of a Cleanup Level for Methamphetamine at Clandestine Drug Labs, Colorado Department of Public Health and Environment, Feb. 2005.

[10] JP Kurtz (Environmental & Mining Systems International, Inc., Longmont, CO, USA) and DJ Folkes (EnviroGroup Ltd., Englewood, CO, USA). Background Concentrations of Selected Chlorinated Hydrocarbons in Residential Indoor Air. Proceedings: Indoor Air 2002.

[11] U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead. July 1999.

[12] U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury, March 1999.

[13] U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury, March 1999.